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## EXPLANATION OF PLATE II.

(All the figures drawn under camera lucida.)

Fig. 1. *Syrphus pyrastris* ♂, from a specimen taken by the author at Laggan, Alberta. Note the swollen frons, and the area of large facets, indicated by the dotted line.

Fig. 2. *Syrphus seleniticus*, ♂, a European specimen sent me by Prof. Bezzi.

Fig. 3. *Syrphus arcuatus* ♂, a specimen sent me from British Columbia by Mr. B. G. Elliott. The demarkation of the area of facets is the greatest I have noticed in this species.

Fig. 4. *Syrphus perplexus* ♂, a specimen taken at Searchmont, Ontario, by Mr. E. B. Williamson. The line of demarkation of the area of enlarged facets fades out on the lower border, the usual condition in this species and *arcuatus*, when present at all.

Fig. 5. *Syrphus pyrastris* ♀, a specimen from Seattle, Washington, taken by the author.

Fig. 6. *Syrphus pyrastris* ♂, front view, same specimen as Fig. 1. Note the extreme width of the frons.

Fig. 7. *Syrphus seleniticus* ♂, front view, same specimen as Fig. 2. Note the narrow frons as in other species of *Syrphus*.

Fig. 8. *Syrphus seleniticus*, wing, a specimen sent me by Prof. Bezzi.

Fig. 9. *Syrphus arcuatus*, wing, same specimen as Fig. 3.

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## STUDIES ON SYRPHIDÆ.—III. AN INTERESTING MERISTIC VARIATION IN SYRPHUS PERPLEXUS.

BY RAYMOND C. OSBURN,

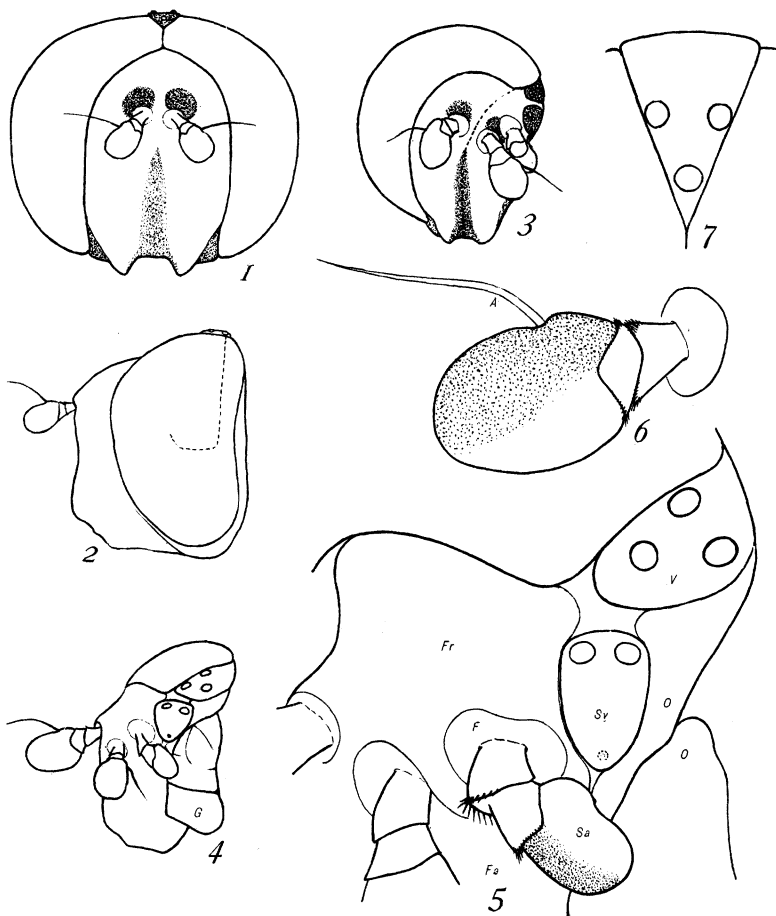
COLUMBIA UNIVERSITY, NEW YORK CITY.

(WITH PLATE III.)

Meristic variations of different sorts have been recorded not infrequently among insects,\* but as far as I have been able to discover, none have been noted which involve the entire suppression of a compound eye and the presence of a complete supernumerary antenna and vertical triangle with ocelli.

The specimen which exhibits these conditions was sent me by Mr.

\* Especially Bateson, Materials for the Study of Variation.



Syrphidæ.

Gustav Chagnon, of Montreal, Canada, who captured it while collecting other Syrphidæ on Montreal Island, Sept. 1, 1907. Mr. Chagnon writes me that he noticed nothing unusual in the actions of the specimen and that it was taken resting on a leaf in the manner characteristic of many syrphids. I have delayed publishing an account of it while working out the synonymy of *Syrphus arcuatus* Fallén and a related new species, *S. perplexus* Osburn, described in the present number of this journal.† This specimen belongs to *S. perplexus*, and is a normal male in all respects except those to be described.

The main features of abnormality are: (1) The total absence of the compound eye of the left side, (2) the presence of a well-developed supernumerary antenna on the left side, (3) a well-developed supernumerary vertical triangle on the left side, (4) the distortion of the head, especially on the left side, due to the suppression of the eye.

The right side of the head is quite normal in the possession of the proper structures, but it is thrown a little out of balance as a result of the absence of the eye of the opposite side. The eyes of the normal male of this, as of other species of *Syrphus*, are extremely large, covering nearly all of the sides of the head. They meet at the top of the head (the condition known as holoptic) for a large part of their width. The vertical triangle is inserted, wedge-like, between the eyes posteriorly (Pl. III, Figs. 1 and 2). The right eye is normal even to the possession of an area enlarged facets, but the absence of the left eye and the consequent lack of development on that side has caused the eye present to appear to extend beyond the middle of the head. This is evidently due to the warping of the morphological median plane of the head (Fig. 3). The face below is nearly normal except that it is slightly depressed, and the antenna of the right side is about in the usual position. The frons is thrown considerably out of the vertical, and the left normal antenna is somewhat lower down than the right one but is normal in structure (Figs. 3 and 4). The color markings of the face, the facial stripe and the supra-antennal spots, are normal except for the twisting (indicated by the dotted line, Figs. 1 and 3) and that the left supra-antennal spot is reduced in size by the encroachment of the additional antenna (Fig. 3).

The supernumerary antenna is situated slightly behind and above

† Studies on Syrphidæ, I, p. 55.

the normal one of the left side. It is located in a separate fossa in all respects like the normal ones, and consists of the usual three joints. The joints are all slightly, but not very materially, different from the normal ones in shape. The third joint lacks the dorsal arista or bristle, but there is present a small tubercle in the position of the arista (Fig. 5), and this I believe is the rudiment of the arista. In the normal antenna of this species the upper and terminal portions of the third joint are pigmented with black, but in the extra antenna the color pattern is reversed, being dark below and yellow above (cf. Figs. 5 and 6). There is no supra-antennal spot such as is seen above the insertion of the normal antenna. The third antenna is also somewhat smaller than the others.

The vertical triangle is in the normal position, but is somewhat misshapen owing to the absence of the compound eye on the left side, which should compress it into a wedge-like form (as in Fig. 7). It possesses the three ocelli of the usual size and nearly normal arrangement (Fig. 5 v). In addition to this there is a supernumerary triangle (Fig. 5, Sv), situated between the normal one and the supernumerary antenna. It bears two well-developed ocelli, the posterior ones a little smaller than usual, but the anterior ocellus is wanting, unless a small prominence near the anterior end of the triangle is to be considered its rudiment. If such is the case, it is entirely devoid of a lens. The position of this triangle is abnormal in that it is out of the median plane of the head and is turned at a wide angle to this plane, pointing downward on the side of the head. It is situated between the frons and the occiput, thus occupying a portion of the space usually filled by the large compound eye. The frons and the occiput do not quite meet around this triangle, and somewhat membranous areas are left above and below it between the frontal and occipital sclerites.

The occiput is greatly distorted on the left side, as a result of the absence of the eye, and it reaches forward on the side of the head to meet the face. It is much wrinkled, and a deep fold runs diagonally downward and forward across it (Figs. 4 and 5).

The gena or cheek, normally, is completely fused with the occiput, while a shallow suture marks it off from the face. In this specimen the facial suture is much exaggerated and the cheek is also marked off above from the occiput by a deep groove. The cheek is also somewhat distorted (Fig. 4, G).

As to what has produced these abnormalities we can only conjecture. The presence of an extra antenna with the suppression of the compound eye naturally recalls the experiments on Crustacea first performed by Herbst\* and since repeated by a number of investigators, where by the excision of the compound eye at a certain level an antenna was regenerated instead. This has been found to hold true for a number of crustacea, but the small amount of experimental work bearing on this question in the insects does not seem to bear out this explanation for the specimen at hand. Tornier† has produced forked antennæ in various species of beetles on regeneration, by cutting off the antennal joints at various levels, but his "Hyperantennie" does not mean the presence of supernumerary antennæ. More recently Werber‡ extirpated the compound eye and antenna of *Tenebrio* larvæ and pupæ, and found that in the only two cases which reached maturity, the eye and antenna were regenerated almost normally, so these experiments throw no light on the abnormalities of this specimen. Even if we should accept the supposition that the antenna represents the eye in this case, we should still have to explain the presence of the extra vertical triangle.

At first glance it might seem that the ocelli and triangle are here replacing the compound eye, since they more nearly occupy the position of that organ. It must be recalled, however, that the ocelli are not in any way homologous with the compound eyes, since they are innervated by different nerves arising from different lobes of the brain, and according to the accepted theory of Grenacher§ are only related in their probable development from primitive similar sources. Unfortunately the specimen is dried and therefore not in a condition to investigate as to the internal soft parts. It may be that the condition is due to some injury of such a nature as to completely overthrow the equilibrium of normal development during metamorphosis, and if such is the case, further experimentation on the regeneration

\* Herbst, Ueber die Regeneration von antennenähnlichen Organen an Stelle von Augen, Arch. Entw.-Mech., Bd. IX, 1899.

† Tornier, Das Entstehen von Käfermissbildung, besonders Hyperantennie und Hymermelie, Arch. Entw.-Mech., Bd. IX, 1900.

‡ Werber, Regeneration des exstirpierten Fühlers und Auges beim Mehlkäfer, *Tenebrio molitor*, Arch. Entw.-Mech., Bd. XIX, 1905.

§ Grenacher, Untersuchungen über das Sehorgan der Arthropoden, etc., Göttingen, 1879.

of the insect head may throw some light on it. For this reason, and also because it is the only case of the kind that has been noticed I have considered it worth while to describe it in detail.

#### EXPLANATION OF PLATE III.

(All figures drawn with camera lucida.)

Fig. 1. *Syrphus perplexus*, normal male, front view, stippled areas indicate color markings.

Fig. 2. *Syrphus perplexus*, side view. The dotted line indicates an area of enlarged eye facets.

Fig. 3. *Syrphus perplexus*, abnormal specimen, front view, showing the twisting of the head due to the suppression of the left eye, color markings indicated.

Fig. 4. *Syrphus perplexus*, side view. *G*, gena.

Fig. 5. *Syrphus perplexus*. Superior lateral view, more enlarged. *Fr*, frons; *Fa*, face; *Sa*, supernumerary antenna; *F*, fossa of supernumerary antenna; *V*, vertical triangle; *Sv*, supernumerary vertical triangle; *O*, occiput.

Fig. 6. *Syrphus perplexus*. Normal antenna, enlarged. *A*, arista.

Fig. 7. Normal vertical triangle, enlarged, showing arrangement of ocelli.



## PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF TUESDAY, OCTOBER 19, 1909.

Held at the American Museum of Natural History. President C. A. Leng in the chair, with twenty-six members and eight visitors present.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

Memorias de Instituta Oswaldo Cruz, Brazil.

Wiener Entomologische Zeitung, XXVIII, Nos. 7 and 8.

Zeitschrift f. Wissenschaft. Insektenbiologie, V, no. 9.

Canadian Entomologist, XLI, No. 10.

Directions for Collecting and Preserving Insects by Nathan Banks, Bull. 67, U. S. National Museum.

The secretary reported that he had, as authorized at the last meeting, sent a letter to Dr. Bumpus thanking him and the Museum authorities for the ample provision which they had made for the meetings and work of the Society.

The president called upon Dr. Bumpus, who responded in a few words.

Dr. Lutz proposed as an active member Mr. Halsey J. Bagg, 611 W. 152d St., and Mr. Barber proposed Mr. C. V. Blackburn, of Stoneham, Mass.